Detailed

Area South of I-10 (Southern Impoundment)

The ecological risk assessments for the area of investigation south of I-10 (also, southern impoundment) were conducted separately from that of the area north of I-10. The SLERA for the area south of I-10 was presented in Appendix E to the BERA (Integral Consulting Inc., 2013) for the northern impoundments. The BERA for the southern impoundment was presented in Appendix D of the Remedial Investigation Report (Integral Consulting Inc. and Anchor QEA, 2013).

A BERA for soils in the area of investigation south of I-10 was conducted using all of the soils data collected during the 2011 and 2012 sampling events. An aerial photograph of the study area, Soil Investigation Area 4, is provided in Figure D-1 [from Appendix D of the RI Report], and sampling locations are shown in Figure D-7 [from Appendix D of the RI Report]. The CSM is presented in Figure 1-2 (from the BHHRA [already listed in human health discussion]). The following receptors were addressed:

- Common garter snake (*Thamnophis sirtalis*)
- Killdeer (*Charadrius vociferous*)
- Baird's pocket gopher (*Geomys breviceps*)
- Virginia opossum (*Didelphis virginiana*)

Ecological screening assessment procedures followed the flow diagram provided in Figure D-3 [from Appendix D of the RI Report], and are listed below. Wildlife exposure assumptions are provided in Table D-16 [from Appendix D of the RI Report]. Soil screening levels for non-VOCs are provided in Table D-6 [from Appendix D of the RI Report], and Table D-11 [from Appendix D of the RI Report] for VOCs. COIs were not considered for further consideration if the following were observed:

- Chemicals detected in 5 percent or less of soil samples within the relevant soil depth interval were not considered chemicals of interest (COIs) for the area south of I-10. The screening based on detection frequency was conducted separately for the 0- to 6-inch and 0- to 24-inch intervals.
- COIs for the soils in the area south of I-10 whose maximum was below a USEPA ecological soil screening level for birds or mammals, or below a Texas median or site-specific median background value were not considered further.
- COIs that are not bioaccumulative (TCEQ 2009) were not considered further, unless they were VOCs. A VOC-specific screening approach was applied and is presented in the RI Report, Appendix D, Attachment B.

Because only terrestrial species were addressed, screening was conducted for soils only. Soil screening for the terrestrial bird (killdeer) and the terrestrial omnivorous mammal (Virginia opossum) was based on soils from 0 to 6 inches deep, and screening for the burrowing herbivorous mammal (Baird's pocket gopher) was based on soils from 0 to 24 inches deep.

Screening specifically for the garter snake could not be undertaken because of a paucity of toxicological data for reptiles and consequent lack of reptile-specific screening values.

Resulting $COPC_{ES}$s for the area south of I-10 included seven metals, total PCBs, dioxins/furans and Bis-2-ethylhexyl phthalate and total HPAH. $COPC_{ES}$s for this area (Table 1-2 [from the RI Report, already listed above in HH and Eco NI sections] for all COPCs and Table D-2 [from Appendix D of the RI Report] for COPCs specific to the southern impoundment) were the same for the burrowing mammals (exposure to soils 0 to 24 inches deep) as for the killdeer, garter snake, and Virginia opossum (exposure to soils 0 to 6 inches deep).

The approach to evaluation of ecological risks for the area south of I-10 was similar to the approach used for the area north of I-10 [as presented in the BERA or Section 5.5.2 of the RI Report]. Concentrations of $TEQ_{DF,B}$ in bird eggs were not estimated because empirical data to describe concentrations of dioxins and furans in foods of bird were not available. TRVs for the BERA for the area of investigation south of I-10 (see Tables D-23 and D-24 [from Appendix D of the RI Report]) are also the same as those used for the investigations of the area north of I-10, except an additional TRV was needed for HPAHs.

Characterization of Risks

Hazard quotients (HQs) for all receptors except reptiles were developed and are provided in Table D-25 [from Appendix D of the RI Report]. Comparison of terrestrial bird and background HQs are provided in Table D-26 [from Appendix D of the RI Report].

Terrestrial Birds

Under baseline conditions, exposure of killdeer to mercury, dioxins and furans, BEHP, HPAH, and PCBs in soils of Soil Investigation Area 4 (see Figure D-1 [from Appendix D of the RI Report and already listed above]) does not result in risks to the assessment endpoint of stable or increasing populations. These COPCEs present no risk to populations of terrestrial birds represented by killdeer.

Baseline risks to individual birds exposed to cadmium, chromium, copper, lead, and zinc in soils of Soil Investigation Area 4 may be present, particularly for lead and zinc. On the basis of average (CT) exposures, the baseline risks to terrestrial birds resulting from exposure to cadmium, chromium, and copper are negligible. For these three metals, estimated exposures exceed the LOAELs only when the upper-bound estimates of the soil concentrations (i.e., RM exposures) are considered. The probability that exposure will exceed the respective avian LOAEL is 9.7 percent for cadmium, 21 percent for chromium, and 35 percent for copper. Due to uncertainties associated with the conservatism of the TRVs and the methods and models used for exposure assessment, overall risks to individual terrestrial birds associated with cadmium, chromium, and copper are considered low. Baseline risks to the assessment endpoint of stable or increasing populations are considered very low to negligible, primarily because of conservatism in the exposure and toxicity estimates, but also because of the relatively low probabilities that exposures will exceed LOAELs, especially for cadmium and chromium.

Baseline risks to terrestrial birds associated with exposures to lead and zinc in soils of Soil Investigation Area 4are present for individuals, and may be present for the assessment endpoint. The probability that exposure to these metals will exceed the respective LOAEL is 88 percent for lead and 68 percent for zinc. Background exposures to these metals are approximately 25 percent of exposures in the exposure unit evaluated in this BERA.

Uncertainty associated with the exposure and toxicity information is considerable. The spatial distribution of metals in soils, combined with ongoing human activity in the area south of I-10, should also be considered in risk management decision-making; the highest metals concentrations in soils occur where human activity is also highest, which may mitigate wildlife exposures. Nevertheless, terrestrial bird HQs greater than 1 were calculated for several metals, suggesting that risks to individual birds are present and population-level risks may also be present.

Mammals

Application of the VOC-specific screen to assess potential risk to the burrowing mammal in the upper 24 inches of soils in the area south of I-10 indicated that VOC concentrations were below levels of concern to small mammals. Under baseline conditions, exposure to $COPC_{ES}$s in soils of Soil Investigation Area 4 does not result in risks to the pocket gopher or opossum, or to other mammals represented by these receptors.

Reptiles

There is insufficient information on the toxicity of $COPC_{ES}$s to reptiles, and about dermal exposures to lipophilic compounds and associated effects on reptiles, to quantitatively address risks to the assessment endpoint of stable or increasing populations of reptiles to soils from Soil Investigation Area 4. Estimated reptile exposure as ingested doses by the common garter snake were compared with those for bird and mammal receptors. The comparison indicates relatively lower potential for oral exposures of reptiles than for birds and mammals to $COPC_{ES}$s under baseline conditions. For this reason, and because risks to $COPC_{ES}$s are low to negligible for birds and mammals, baseline risks to reptiles to soils in the area south of I-10 are also considered to be low to negligible.